ENERGY UPDATE

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A POWERFUL BREAKTHROUGH - THE KALINA CYCLE!

Several years ago the California Energy Commission teamed up with Exergy Inc. to develop a technology that boosts electrical production at steam-powered plants while reducing fuel consumption. With two-thirds of the world' s power generated at such plants, the opportunity existed for significant energy savings while maintaining electricity output from these power plants.

A New Era in Power

The Kalina Cycle represents a new era in power generation. It allows plants to generate electricity at lower cost, use fewer resources, and produce lower emission levels. The Kalina Cycle is dramatic progress over the technology of the past.

About 150 years ago Scottish engineer William Rankine invented the steam power plant now used to make electricity . This traditional approach used a heat source — coal, oil, natural gas, or geothermal heat — to produce the high-pressure steam that drives the turbines. The Rankine Cycle is not an efficient process, converting only about 35 to 40 percent of the heat energy released into electricity .

The prototype Kalina Cycle at the Rockwell Canoga Park site.

Power plants using the Kalina Cycle can produce more energy for California consumers and businesses than the Rankine Cycle, an outcome which will also sharpen California' s competitive edge in global markets by harnessing the international trade and investment that have driven the California economy in recent years.

How the Kalina Cycle Works

Making more efficient power plants requires better turbine work from a heat source and sink, or cooling water or air . As the turbine has direct contact with only the working fluid, the work produced by the turbine depends not only on the conditions of the heat source and sink, but also on the conditions of the working fluid. Therefore, the working fluid is one of the most important components of a power plant.

The Kalina Cycle is a more efficient power cycle because it replaces the conventional water working fluid with a working fluid that can better duplicate the heat source and sink. This working fluid is a mixture of ammonia and water . The Kalina Cycle also incorporates special system designs that specifically exploit the virtues of the mixture for a high degree of heat recuperation within the cycle.

(Cont.)

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PUBLIC INTEREST ENERGY RESEARCH
"Research Powers the Future"

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STEVE LARSON, Executive Director

The Kalina cycle can be used with any fuel, geother - mal source or excess energy .

Exergy predicts that with the Kalina technology, geothermal plants can post an efficiency gain of up to 50 percent while coal-fired plants will operate 20 percent more efficiently with the technology.

"The Kalina Cycle demonstrates the pay-off when the state and private industry focus on developing cheaper and more reliable energy for California consumers and taxpayers," said Energy Commissioner Art Rosenfeld. "Not only has California supported and funded in part the scientific work involved, but the state and ratepayers will be rewarded with a share of its commercial success."

Investing in Power and the Future

The California Energy Commission funded the first ever Kalina Cycle pilot plant in Canoga Park, California. Under the terms of a royalty agreement, **Exergy will pay back total royalties of $6.75 million over a period of time based on its gross revenues – that's three times the original state investment. The Energy Commission will plow back the royalties to fund future projects, thus providing a mechanism for a successful project to fund other energy research projects in the future.**

The Kalina Cycle has drawn the attention of prominent investors and is now licensed to such major manufacturers of power-plant equipment as General Electric, ABB, Europe's Ansaldo Energia, and Japan's Ebara Corporation.

The California Energy Commission works with California energy research firms to develop cost-effective, alternative sources of energy. The Kalina cycle was one of the first projects funded by CEC, the first to sign a royalty agreement, and the first to pay royalties to the Commission.

The Commission's Public Interest Energy Research (PIER) Program is dedicated to improving the quality of life in California through the continued introduction of environmentally sound, safe, reliable and affordable energy services and products into the marketplace.

Products like the Kalina Cycle strengthen California's economy, increase energy supply, protect the environment and reduce electricity demand at peak times. Now that's a good bargain.

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